TICS modelling : Conception of questionnaire

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Introduction

Within the framework of the action "TICS Modelling" supported by the MSHE[1] and the ENTI[2], we develop a computing modelling having for objective to define clearly the concepts connected to the territorial intelligence and in particular to the tools allowing to estimate the situation and the expectations (work, accommodation) of a group of individuals. The modelling of the "Territorial Intelligence Community Systems", or TICS is useful to transcribe the methodological and technical specifications elaborated within the framework of the caENTI in a generic language accessible to computer specialists, but independent from specific informatics languages. It also allows researchers in social sciences and actors to exchange with researchers in computer science in order to elaborate reliable and long-lasting solutions.

The Catalyse toolkit suggests territorial actors a method and tools to make a diagnosis of the community needs and then to evaluate the services implemented to meet these needs. Mainly intended for multisector development partnerships, it is a territorial intelligence method which uses information technologies and aims to develop global approach, partnership and participation in a sustainable development logic.

The Catalyse toolkit has allowed for years to many field actors to conceive questionnaires, to use them to collect information and then to analyse these data. Pragma, which is the first tool of this toolkit, realizes the conception of questionnaires, the collection of the result from the submission of questionnaires to individuals and the quantitative processing of these results. Questionnaires and tools which deal with them (conception, capture, analysis) are fundamental elements of our modelling. So the precise definition of a questionnaire from a computing point of view is one of the first phases of the modelling.

In this article we present the fundamental concepts displayed within the framework of the modelling of questionnaires by focusing on their conception.

[1] Maison des sciences de l'homme et de l'environnement Claude Nicolas Ledoux - http://mshe.univ-fcomte.fr/

[2] European Network of Territorial Intelligence - http://www.territorial-intelligence.eu

Following the numerous experiments realized with the Catalyse toolkit, it turns out important to develop the notion of questionnaire. Besides, from a computing point of view, a formal description of questionnaires allows assuring a better development of the future tools, and especially assuring their durability.
So in the article we present a reminder of the objectives and the context (Catalyse toolkit) of our modelling: the TICS modelling project. Then we explain how we model the conception of a questionnaire.

1 TICS modelling project

1-1 Modelling for the development of computer systems

The complexity of the computing systems design is one of the main reasons justifying the modelling. A model is an abstraction of a real system. Only elements having some importance are taken into account. The model so created simplifies the real system which it represents and helps in its understanding. It is easier to handle and allows a communication between the persons who are responsible for the modelling and the persons of the concerned domain.
A language of modelling which allows to describe a model, is a notation (pseudo-code, graphic representation) semantics of which is defined by a meta-model of the language.
The standard language for the modelling is UML (Unified Modelling Language).
We chose this language as our modelling, but in this article in pedagogic purposes we do not use our models UML to present the realized work. Indeed the realized models UML are relatively complex and with difficulty readable for a non-computer specialist.

1-2 TICS computing modelling

A TICS is a Territorial Information System or TIS, that is a tool used by the territorial actors [deliverable 58]. Internet sets out the tools distant use, but also a possibility of stronger communication between different TIS actors. This possibility drives to a fundamental TIS evolution towards the TICS.
In the caENTI, the work package Wp6p worked on tools specifications [deliverable 60]. The catalyse toolkit was the starting point of these specifications. Based on this work, we develop a computing modelling of the TICS.

1-3 Catalyse toolkit

The aim of Catalyse is [deliverable 60] sharing and confronting the useful information for the territories sustainable development. Catalyse allows the actors answering three questions:
- Which are the people's needs?
- Can the resources (individual and collective, private and public products and services) available on the territory meet these needs?
- Which are the forces and weaknesses of the territory that favour or impede a better adaptation of resources to people's needs?

Catalyse uses softwares designed by the ThéMA[3]: Pragma and Anaconda. The Catalyse toolkit harmonizes and updates these software, improves their accessibility and completes their documentation. The integration of the Catalyse tools within a territorial information system links quantitative analysis, qualitative analysis and spatial analysis in order to determine and compare the people's needs profiles and the services profiles within a context defined by territorial indicators.

[3] ThéMA: Research team in territorial intelligence to lead research in humanities and social sciences. http://www.thema.univ-fcomte.fr

The modelling presented in this article focuses essentially on a part of Catalyse toolkit: Pragma.

1-3-1 Pragma software

The Pragma software was created in 1991 to digitalize the data, make a statistical data qualitative analysis and code the data tables for qualitative processing. Each actor can record its data and exploit them, before sharing them in a unique database. The data can be brought together in real time to make quantitative dashboards by project or at the territory level. ePragma the online version of Pragma, records the answers and stores them in a unique database.

1-3-2 Anaconda software

Anaconda allows to spread the use of the data qualitative analysis methods (factorial analysis and classification) in Humanities and Social Sciences. They are multi-criteria methods that allow analyzing statistical individuals described by a multidimensional characters set. The factorial analysis determines the structural factors or trends of an important data set. The classification dissociates its main classes. It is completed by Nuage that represents the Anaconda results in three dimensions.

1.4 Questionnaire

According to the deliverable 60, a questionnaire is a list of independent questions which the number, their order and their wording can't change during the data collection. In our model we add the notion of theme. Our new definition of a questionnaire is: a questionnaire is a list of ordered questions, organized according to theme.

To allow a wide public to understand our work, we suggest describing the basic elements of our modelling by means of a part of the European Individual diagnostic and evaluation guide, questionnaire proposed in the CAENTI deliverable 60. This questionnaire is divided into various parts. Every part groups together questions relative to the same theme. For example, this questionnaire has parts concerning the following themes:

- Personal data and family unit
- Housing
- Health context
- Individual and social autonomy
- Employment

2 Questions modelling

Questions are basis elements of a questionnaire. A question is defined by its wording that defines its sense.
We propose in the figure 1, a simplified view of the question's model.
A *question* proposed in questionnaires is drafted according to societies, ways of life and many other parameters which are specific to a *territory*. A territory is defined with a geographical area and a language. A question can have an "equivalent" question linking to another territory.
The *possible answers* to a question can take 3 *answer formats* :
- the *modalities* which form a list of possible answers when the question is "closed".
- the answer to an "open question" can be compelled by an input *mask*. For instance, phone numbers are limited to 10 numbers; the number of children is an integer …

- the *obligatory modalities* are proposed to the user for all the questions. At present, there are two obligatory modalities called “Without Answer” and “Without Object”. They respectively express the fact that there was no answer to a question and the fact that certain questions are asked only according to the answer to another question.
When a modality is associated with a question it is attributed a *type of modality* which can be: *exclusive*, *unique* or *multiple*.

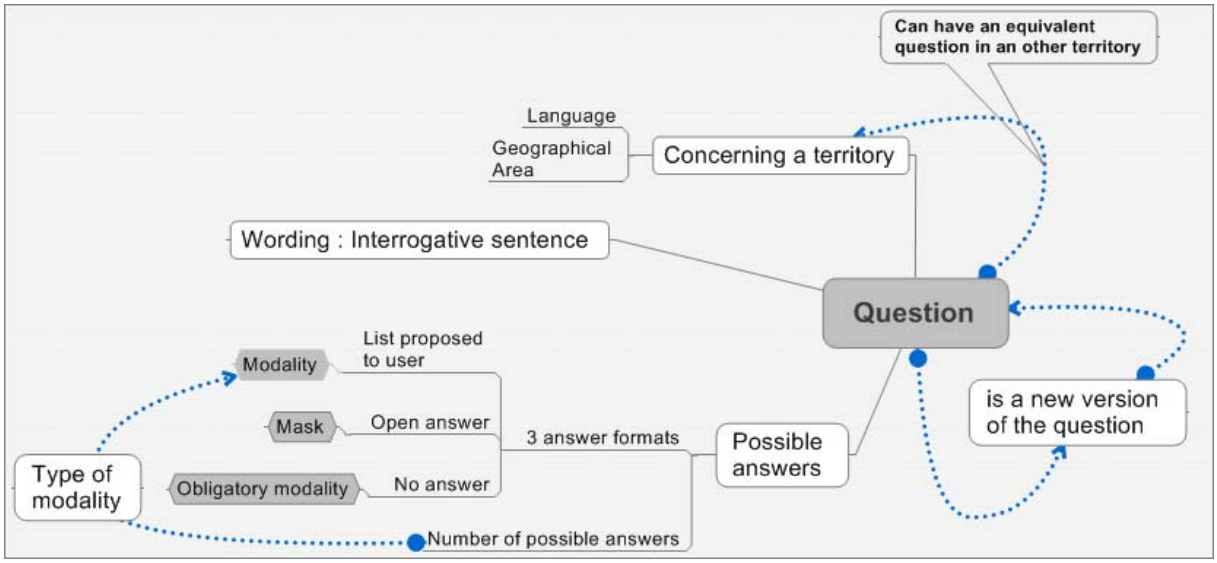

Figure 1 : The questions

The contributions of our modelling, with regard to the specification of a question in the deliverable 60, are:

- it exists only one kind of question,
- the association of the obligatory modalities for all the questions,
- the introduction of the link between question and territory.

3 Questionnaire modelling

To be able to define in a complete and exhaustive way a questionnaire and be able to manipulate it in an automatic way with computing tools, it is not only necessary to describe its questions but also its organization. Our modelling proposes a description of the organization of the questions within a questionnaire that facilitates the re-use and the use by computing tools.

3.1 Blocks

This notion is introduced in our modelling to describe the organization of a questionnaire. The notion of blocks does not exist in the catalyse toolkit. We distinguish two different kinds of blocks:

- the *Construction Blocks*: which helps to construct a questionnaire, from the operational point of view. These blocks will be used by the software tools to make up questionnaires.
- the *Thematic Blocks*: which helps to conceive a questionnaire, from the thematic point of view.

The figure 3 presents a part of the European Individual diagnostic and evaluation guide. This is the part relative of the “Personal data and family unit” theme. It illustrates in a concrete way the notion of block in a questionnaire.

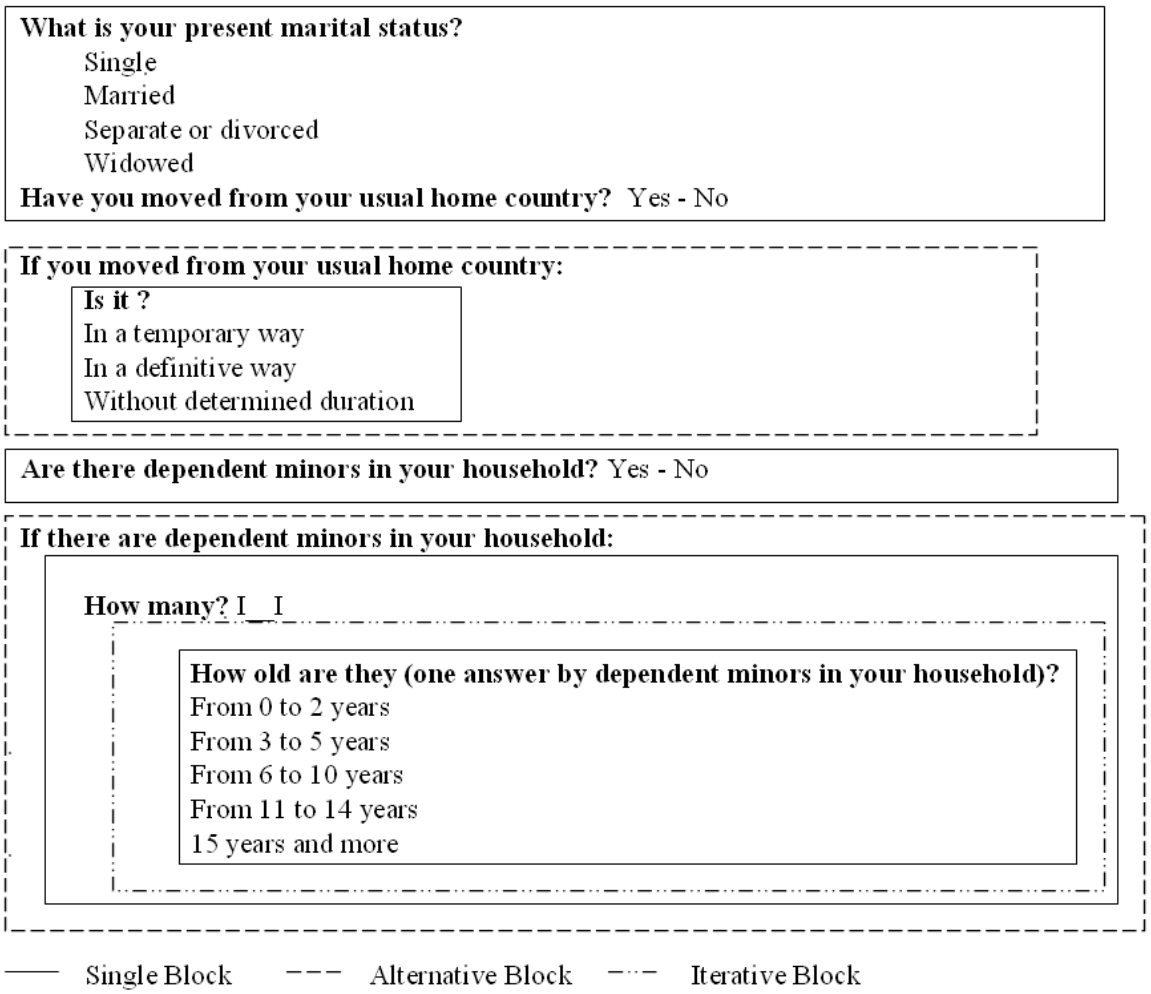

Figure 2 : Examples of blocks in a questionnaire

3.1.2 Construction blocks

There are three kinds of *Construction Blocks*: *Single_Block*, *Alternative_Block*, and *Iterative_Block*.

A *Single_Block* consists only of questions, each question has a rank in it. In the figure 3 there are 5 Single_Blocks, and the first one is made up of two questions.
An *Alternative_Block*: the questions of this block are proposed to the individual questioned only if a specific answer to a previous question was made. An Alternative_Block is made up of one condition and a set of ordered constructions blocks. It can't contain directly questions. In the figure 2 there are 2 Alternative_Blocks. The condition of the first one is defined by the modality "yes" of the previous question. And this Alternative_Block is made up of one Single_Block.
A *Iterative_Block*: the questions of this block can be proposed several times depending on the answer to a previous question. So the Iterative_Block is linked to a question which gives its iteration value. Like the Alternative_Block, it is made up of a set of ordered construction blocks. In the figure 2 there is one Iterative _Block. The iteration value is associated with the answer of the question "How many". If this answer is 3 for example, the question in the Iterative _Block "How old are they ?" will be ask 3 times.

4.1.3 Thematic Blocks : TB

A *Thematic Block* corresponds to a structured element which presents questions according to a precise order, in touch with the theme which it handles. A TB (see figure 3) is constituted from construction blocks ranked in a certain order.

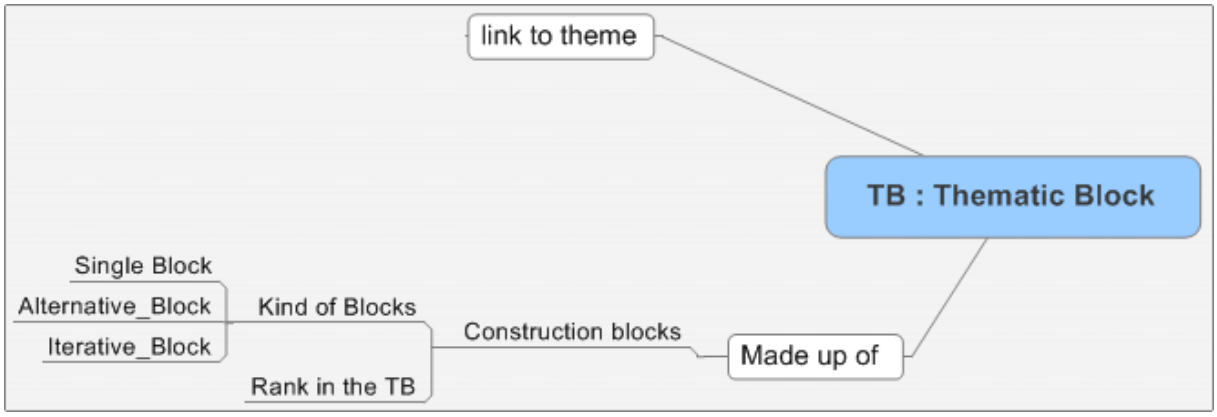

Figure 3: The TB

4.2 Pool

Basic elements (questions and BTT) allowing the construction of a questionnaire are given to the designers of questionnaires through the pool of elements of constructions of a questionnaire. Thus, every element conceived for a questionnaire can be reused in other questionnaires.

At present the Catalyse toolkit do not take into account this pool. The introduction of the pool in our modelling has for objective the evolution of tools considering this consideration.

4.2.1 Questions Pool

The pool of questions corresponds to the set of questions from which it is possible to draft a questionnaire or a part of a questionnaire. The modelling of the pool of questions takes into account:

- The consideration of territories. Questions concern different territories can be declared equivalent.
- The classification of the questions. A theme or some keywords can be attached to a question. This classification allows the search for questions in the pool.
- The life cycle of the questions. The elements of the pool of questions should be flexible to modification, but it is interesting to keep all the versions of the questions of the pool. It allows to see the evolution of a question in the time, and to compare various questions.

4.2.3 Thematic Typical Blocks Pool

A Thematic Typical Block or TTB can be considered as a TB, designed by the experts of the CAENTI and independent from any questionnaire. A TTB is a reference block with regard to the theme which it handles. Moreover a TTB is linked to a territory.

A TTB is a “part” of questionnaire that is proposed to the persons who build questionnaire. It can be reused in various questionnaires. It’s composed by questions concerning one theme and one territory.

A TTB is composed of several Construction Blocks ordered with a rank.

Conclusion

One of the main contributions of the works presented in this article is the modelling of the organization of a questionnaire. So this organization can be treated in a computer way.
Our modelling allows formalizing certain practices of the designers of questionnaires. Indeed these designers are used to reusing questions or complete parts of questionnaires existing during the conception of a new questionnaire. Until now this practice was made copy/cut between questionnaires. It can now be realized directly with the computing tools thanks to the TTB and Questions pool. An inexperienced person in the conception of questionnaire can easily build a suitable questionnaire from the pool.
At present the development of a tool to manage the pool of element of construction of a questionnaire is in progress.
To complete the modelling of questionnaires it is necessary to describe additional notions such as variable of synthesis, instrument panel.
Once the conception of a questionnaire was completely modelled, the following stage will be to model the data collection. For it, it will become necessary to take into account the follow-up of the individuals, the repetition in time of inquiries.

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